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MISSOURI UNIV-ST LOUIS DEPT OF PHYSICS
POTENTIAL LASER ACTION IN HE-METAL VAPOR MIXTURES.(U)
NOV 80 J J LEVENTHAL

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N00014-76-C-0760

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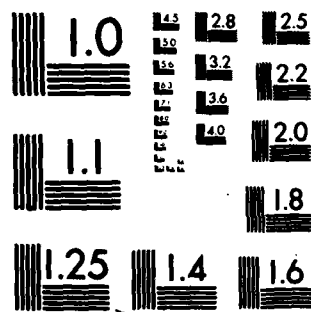
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(12)

LEVEL III
p. 594

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER

-4-

2. GOVT ACCESSION NO.

AD-A092 599

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Potential Laser Action in He-Metal
Vapor Mixtures ,

5. TYPE OF REPORT & PERIOD COVERED

Research Summary

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

Jacob J. Leventhal Professor of Physics

8. CONTRACT OR GRANT NUMBER(s)

N00014-76-C-0760

9. PERFORMING ORGANIZATION NAME AND ADDRESS

University of Missouri - St. Louis
8001 Natural Bridge
St. Louis, Missouri 6312110. PROGRAM ELEMENT, PROJECT, TASK
AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Office of Naval Research
Arlington, Virginia

12. REPORT DATE

1 November 1980

13. NUMBER OF PAGES

2

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report)
unclassified15a. DECLASSIFICATION/DOWNGRADING
SCHEDULE
UNC

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Excited State Production
Laser
Population Inversion

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Cross sections for excited state production in ion-molecule
collisions have been measured by observing radiation
resulting from decay of the excited species. Recent work
involving collisions of He⁺ with Li in discussed.DTIC
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S/N 0102-LF-014-6601410890 LB
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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November 1980

Research Summary: ONR Contract No. N00014-76-C-0760

"Potential Laser Action in He-Metal Vapor Mixtures"

1. Principal Investigator: J. J. Leventhal
Professor of Physics
✓ Department of Physics
University of Missouri - St. Louis
St. Louis, Missouri 63121
2. Contract Description: Experimental studies of inelastic atomic and molecular collision processes. Such processes can selectively populate excited states of the product species, and may thus be potential sources of population inversions capable of producing laser action.
3. Scientific Problem: The most important aspects of this work are to determine the fundamental rules that govern internal energy level population in molecular collisions. Using the experimental technique developed at UMSL for the study of such processes, specific collision systems can be tested for promise as lasers.
4. Scientific and Technical Approach: The experiments are performed by combining molecular beam techniques with those of emission spectroscopy. A low energy mass selected ion beam is intersected by a thermal energy atomic or molecular beam. Photons from radiative decay of excited product species are dispersed and detected thus providing an emission spectrum that is characteristic of the energy transfer process. This spectrum directly provides the desired information.
5. Progress: During the past contract period an important apparatus modification, the incorporation of grazing incidence spectrometer capable of dispersing radiation at soft x-ray/xuv wavelengths (250-600Å), was completed, tested and calibrated. Preliminary results of a collision system that shows promise for x-ray super-radiance, $\text{He}^{++}\text{-Li}$, were reported.
6. Publications:
 1. "Soft x-ray emission from $\text{He}^{++}\text{-Li}$ collisions", J. L. Barrett and J. J. Leventhal, Appl. Phys. Lett. 36, 869 (1980)
 2. "Selective formation of $\text{He}^+(n=3)$ in $\text{He}^{++}\text{-Li}$ collisions", J. L. Barrett and J. J. Leventhal, Phys. Rev A (in press)
7. Extenuating Circumstances: None
8. Unspent Funds: None
9. Graduate Students: None
10. Other Federal Support: DOE \$59,000 June 1, 1980-May 31, 1981

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